What is claimed is:

1. A superconducting structure, comprising:

   a) a substrate having a surface;

   b) an HTS film grown on said surface and having an a-b plane parallel to said surface and a c-direction normal to said surface, said HTS film having a residual compressive strain in said a-b plane and a residual tensile strain in said c-direction, wherein said residual compressive and tensile strains are not caused by a lattice mismatch between said substrate and said HTS film.

2. A superconducting structure according to claim 1, wherein said HTS film has a thickness of at least 500 Å in a direction normal to said surface of said substrate, said residual compressive and tensile strains being substantially uniform throughout said thickness.

3. A superconducting structure according to claim 2, wherein said thickness is at least 1000 Å.

4. A superconducting structure, comprising:

   a) a substrate having a surface;

   b) an HTS film grown on said surface and having a thickness normal to said surface, an a-b plane parallel to said surface and a c-direction normal to said surface, said thickness being greater than the maximum thickness to which said HTS film can be pseudomorphically grown before pseudomorphic strain is released by dislocations occurring in said HTS film, said HTS film having a residual compressive strain in said a-b plane and a residual tensile strain in said c-direction that are generally uniform throughout said thickness.

5. A superconducting structure according to claim 4, wherein said thickness is at least 500 Å.

6. A superconducting structure according to claim 5, wherein said thickness is at least 1000 Å.

7. A superconducting structure, comprising:
   a) a substrate having a surface;
   b) an HTS film grown on said surface and having an a-b plane parallel to said surface and a c-direction normal to said surface, said HTS film having a compressive strain in said a-b plane and a tensile strain in said c-direction, wherein said compressive and tensile strains induce into said HTS film a T_c higher than that achievable by pseudomorphic epitaxy.

8. A structure, comprising:
   a) a first substrate having a substantially unbowed first surface and a first bulk lattice constant; and
   b) a first film made of a material having a second bulk lattice constant different from said first bulk lattice constant, said first film grown on said first surface and having fewer dislocations than achievable by growing a second film made of said material on a second surface of a second substrate when the second surface has a surface lattice constant equal to said first bulk lattice constant.

9. The structure according to claim 8, wherein said first film has a substantially dislocation free thickness greater than achievable by growing a second film made of said material on a second surface of a second substrate when the second surface has a surface lattice constant equal to said first bulk lattice constant.

10. The structure according to claim 8, wherein said material is an HTS material.

11. A structure, comprising:

a) a first substrate having a first thermal expansion coefficient; and

b) a first film grown on said first substrate at a growth temperature wherein said first substrate and said second substrate are at said growth temperature, said first film comprising a material having a second thermal expansion coefficient different from said first thermal expansion coefficient, said film having an operating temperature different from said growth temperature and a thermal strain at said operating temperature, said thermal strain being less than would occur by growing at said growth temperature a second film made of said material on a second substrate having said first thermal expansion coefficient and cooling said second film and said second substrate to said operating temperature.

12. A structure according to claim 11, wherein said material is an HTS material.